

REPORT DOCUMENTATION PAGEForm Approved
OMB No. 0704-0188

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Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

7 items enclosed

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

12 July 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2002-180**
C.T. Liu (PRSM), "Multi-Scale Strain Measurements of a Multi-Phase Material"

MESO 2002

(Statement A)

(Aalborg, Denmark, 26-30 August 2002) (Deadline: 21 Aug 02)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

Comments: _____

Signature _____ Date _____

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.

Comments: _____

Signature _____ Date _____

3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b) appropriateness of references, if applicable; and c.) format and completion of meeting clearance form if required

Comments: _____

Signature _____ Date _____

4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability

Comments: _____

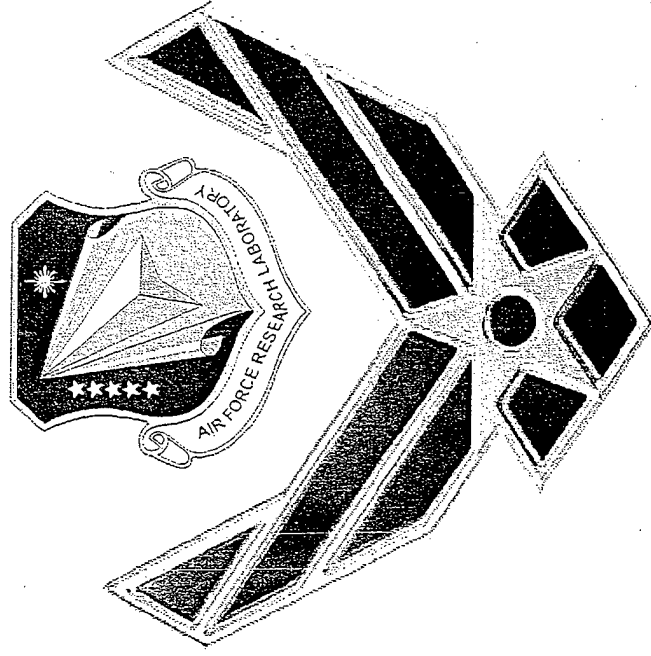
APPROVED/APPROVED AS AMENDED/DISAPPROVED

PHILIP A. KESSEL

Date

Technical Advisor
Space and Missile Propulsion Division

Multi-Scale Strain Measurements of a Multi-Phase Material



C. T. Liu

AFRL/PRSM

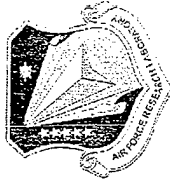
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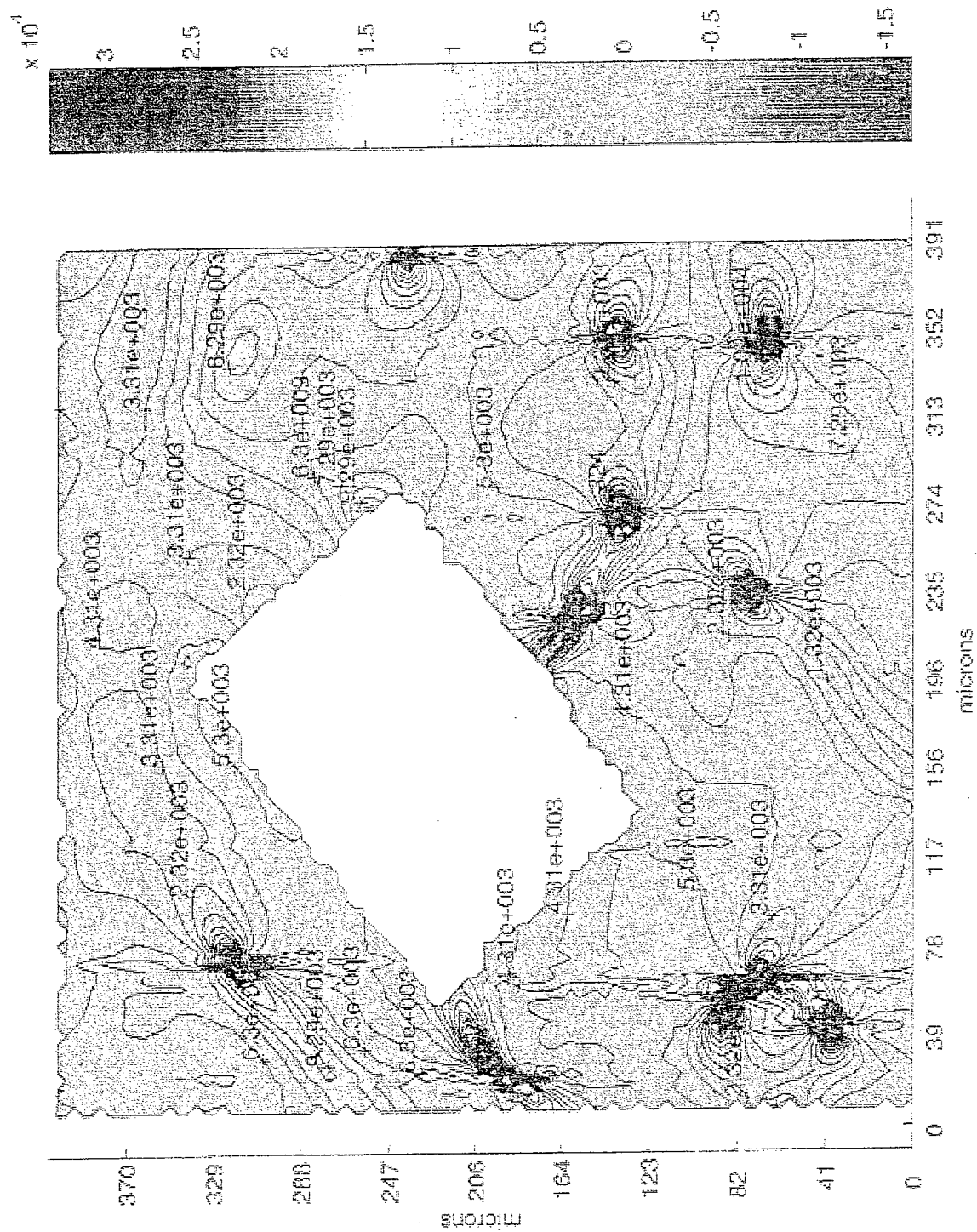
30 June 24/02 MESO

Objectives



- ✖ Investigate the Effects of Time and the applied load on the Strain Distributions near a Filler Particle under Constant Load Conditions.
- ✖ Investigate the Effect of Microstructure on the Strain Distributions near a Crack Tip.
- ✖ Investigate the Damage and Crack Growth Mechanisms in the Material under a Constant Strain Rate Condition.

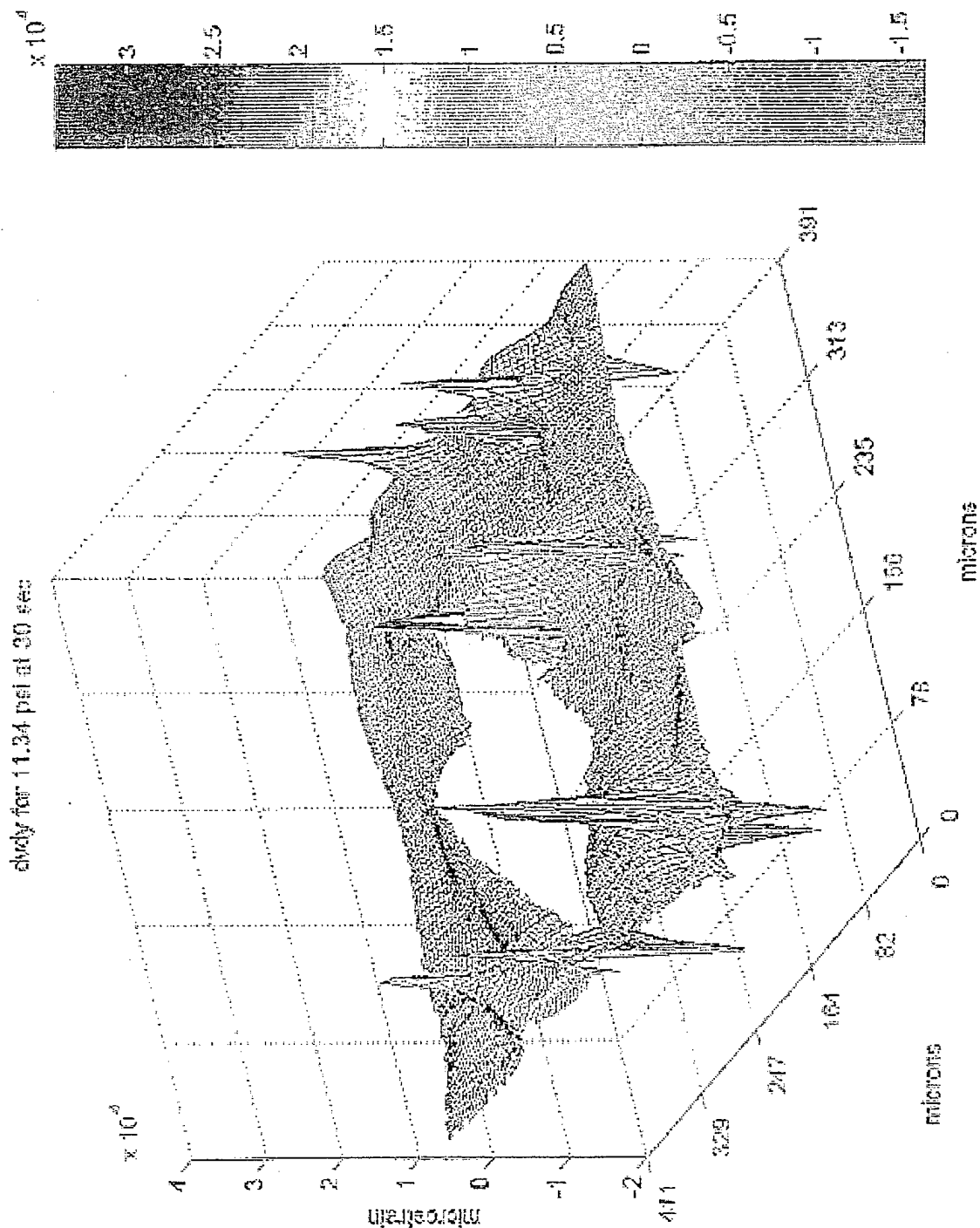
ε_y for 11.34 psi at 30 sec



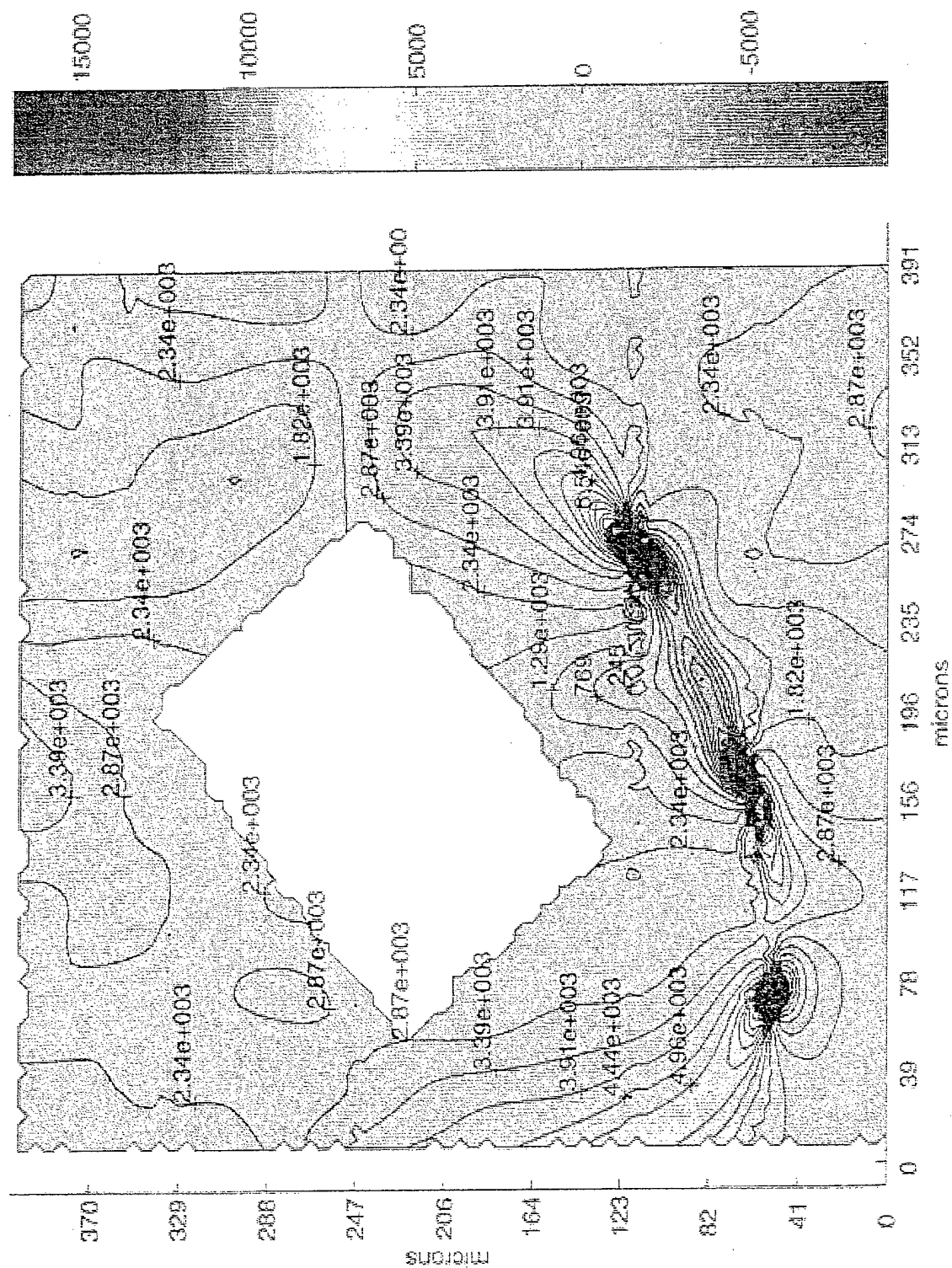


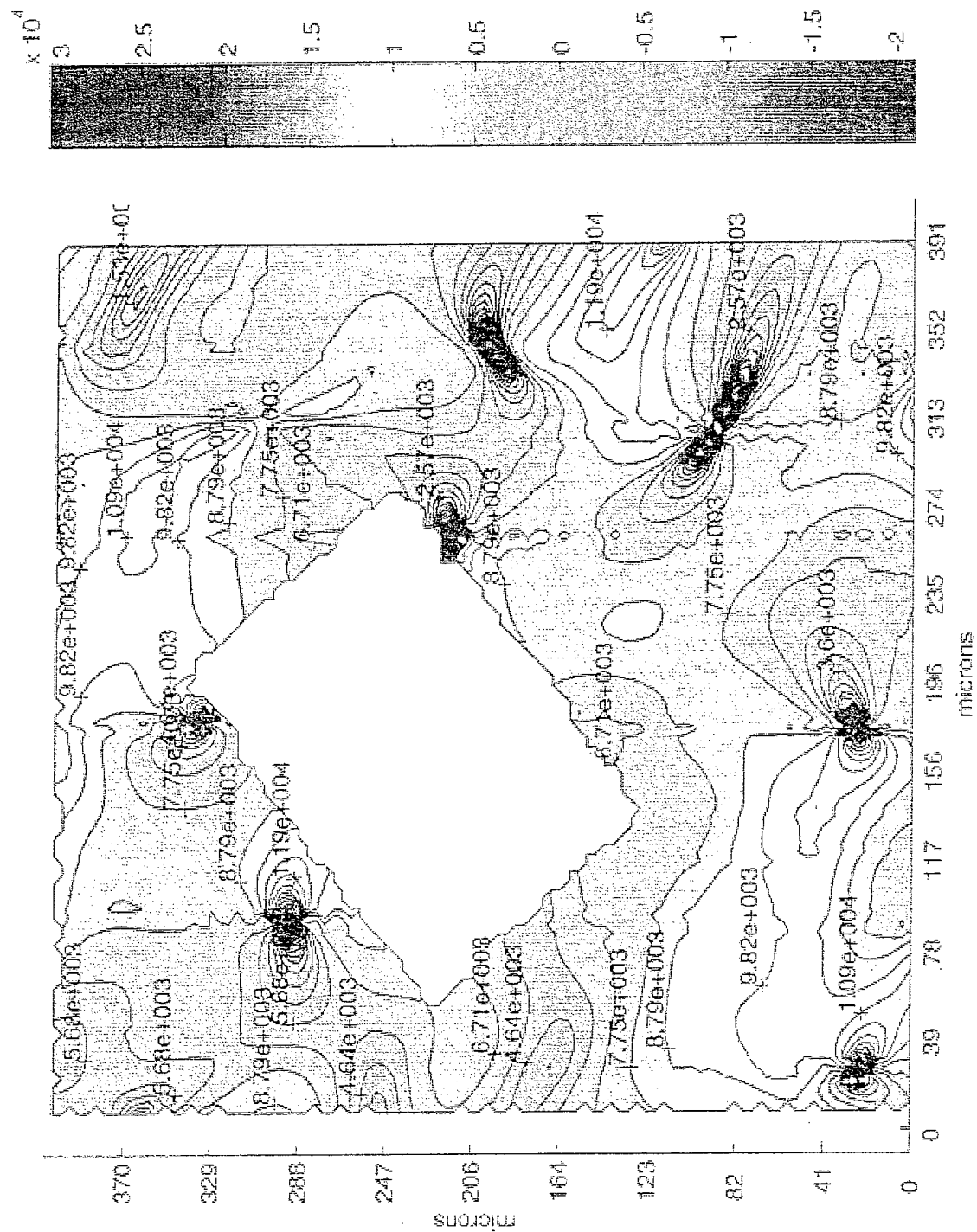
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ϵ_y for 11.34 psi at 30 sec

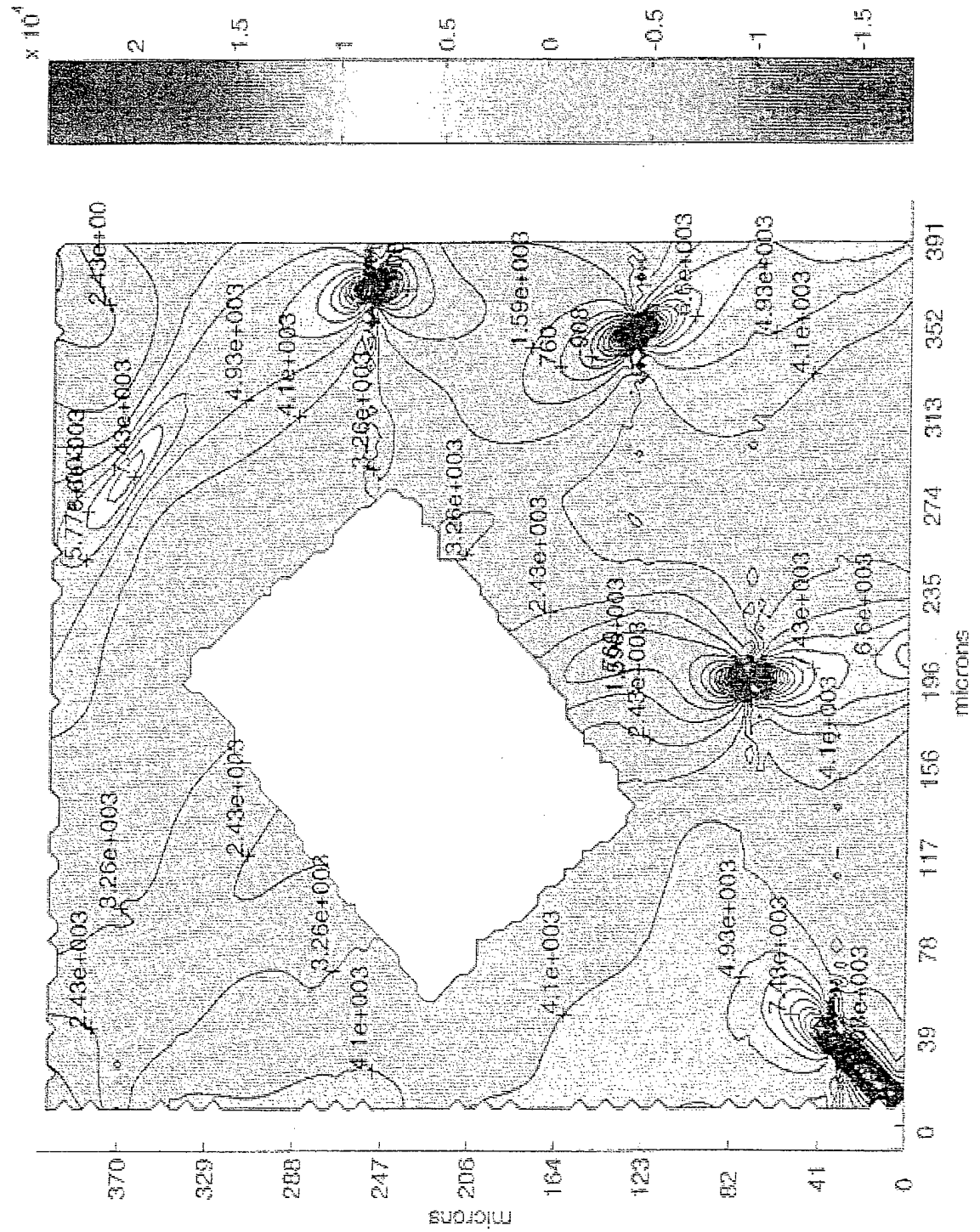


ϵ_x for 11.34 psi at 30 sec





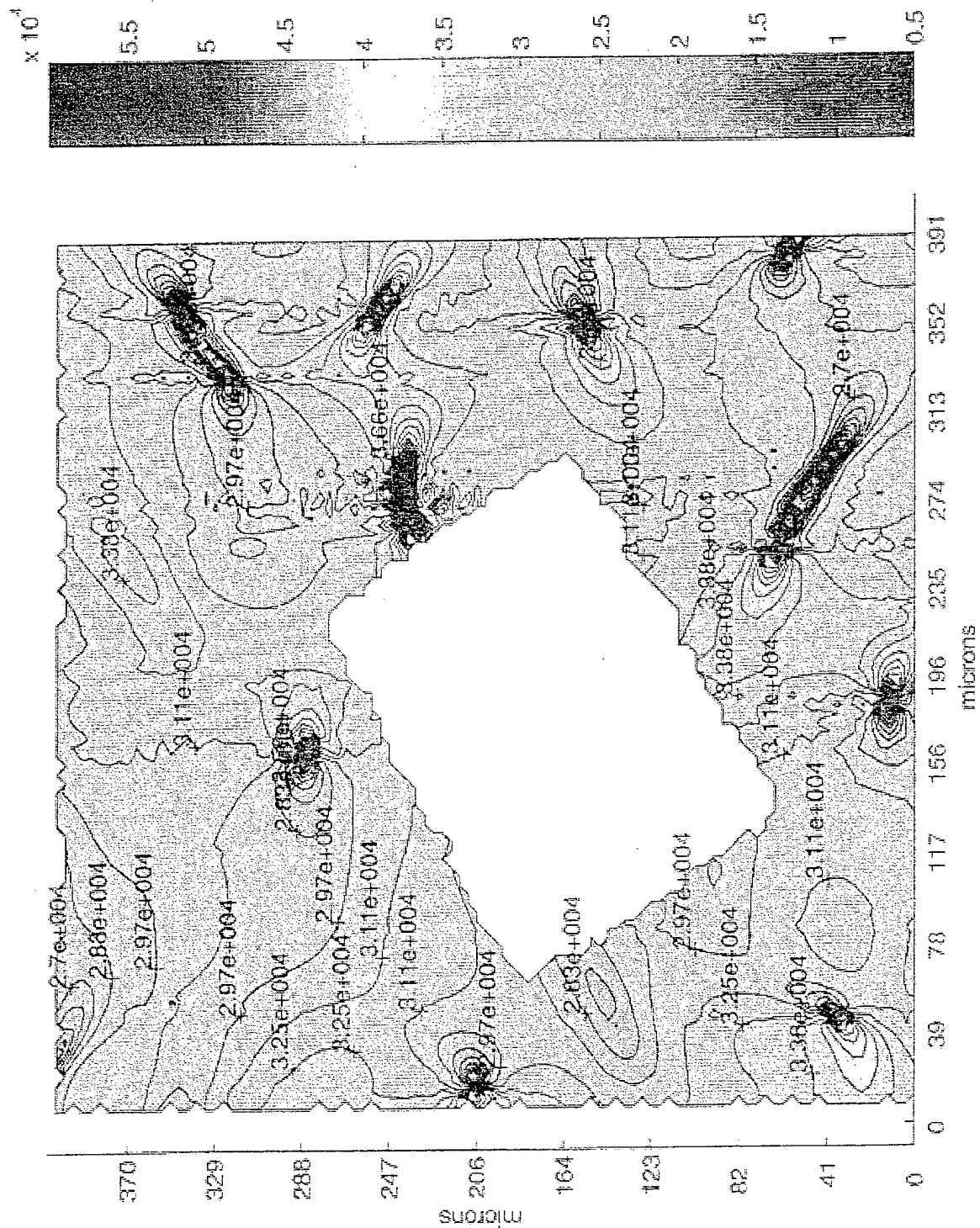
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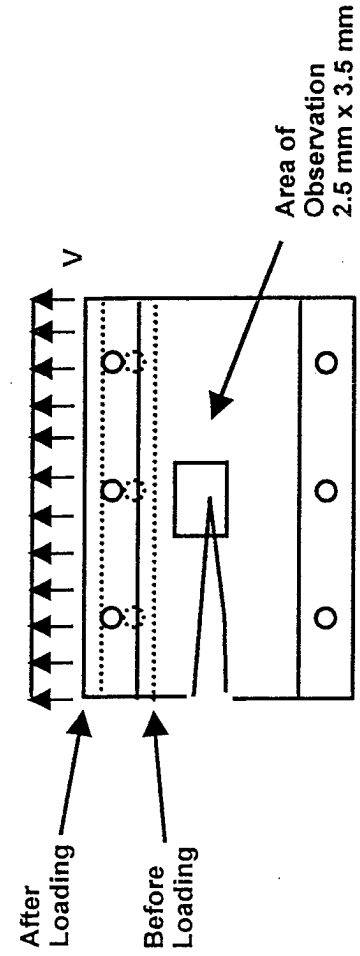
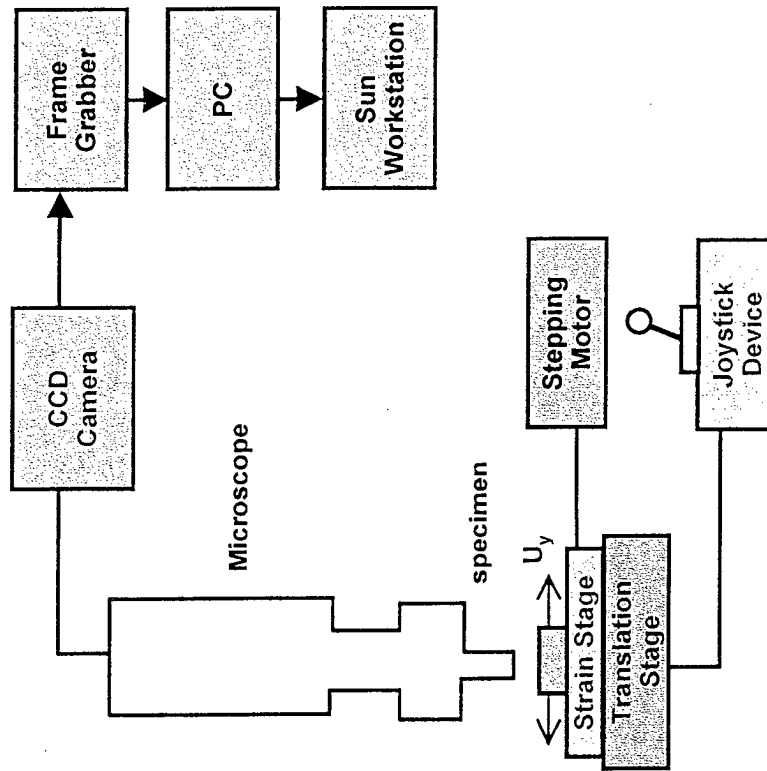


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ϵ_y for 33.66 psi at 30 sec



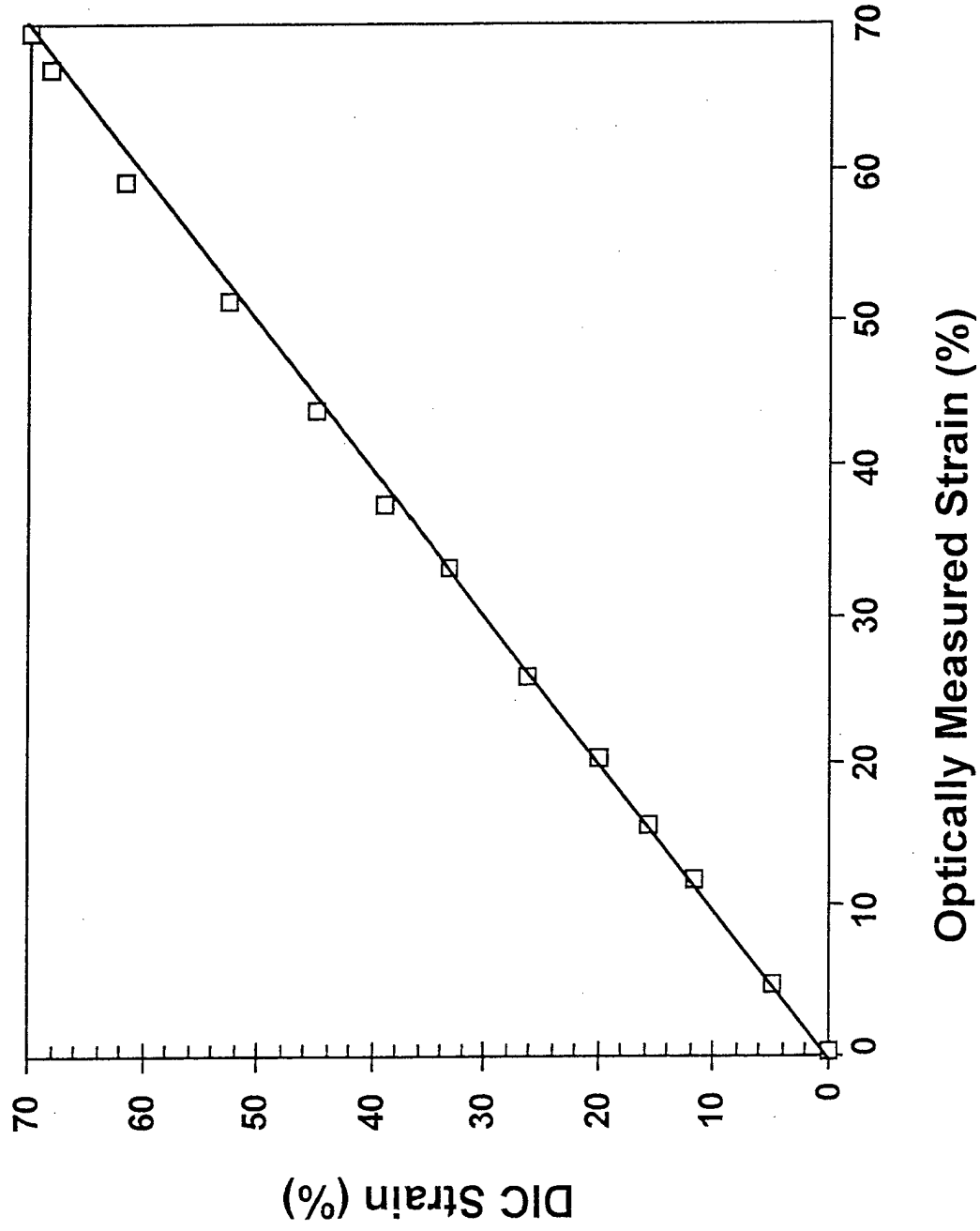






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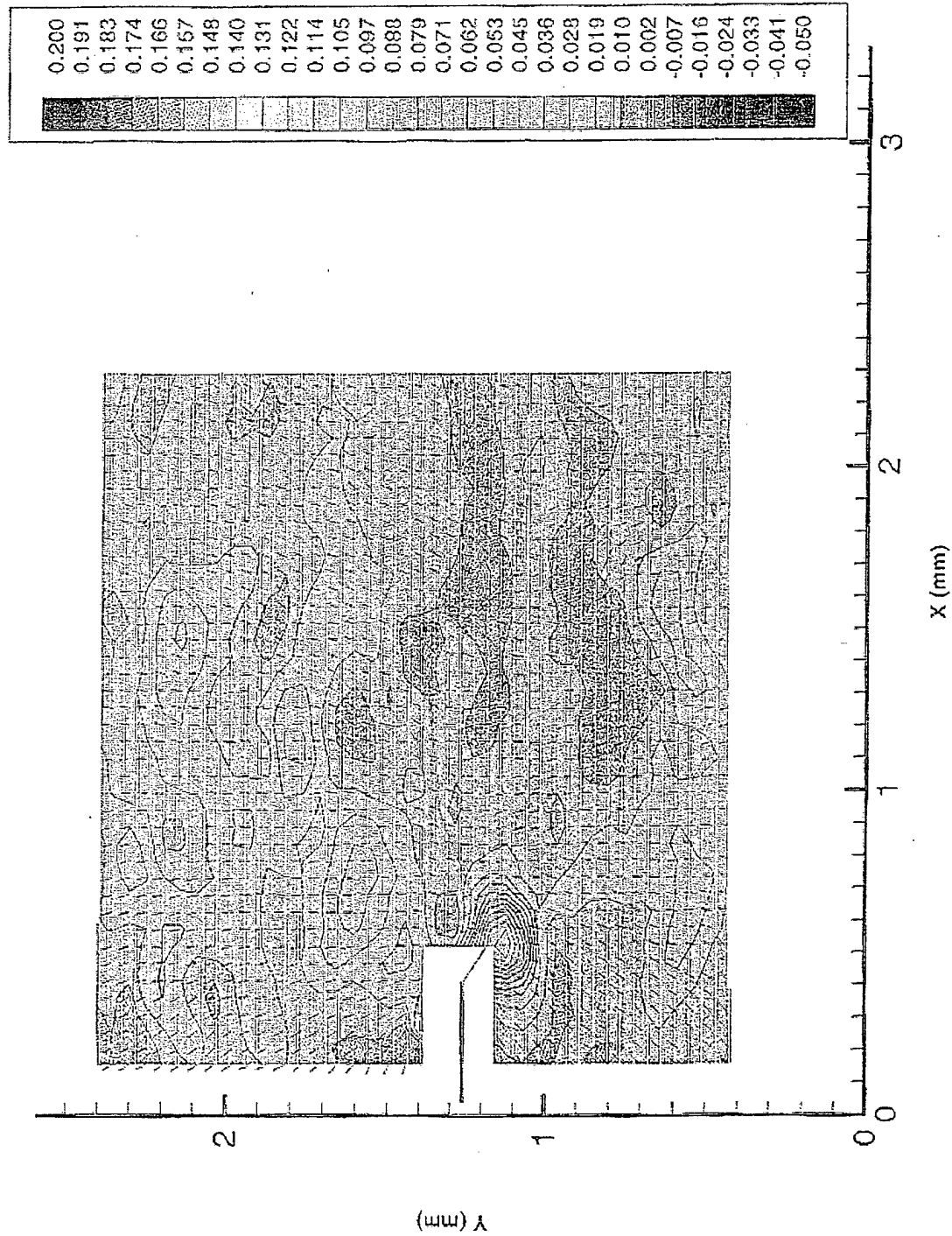
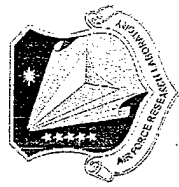
Calibration





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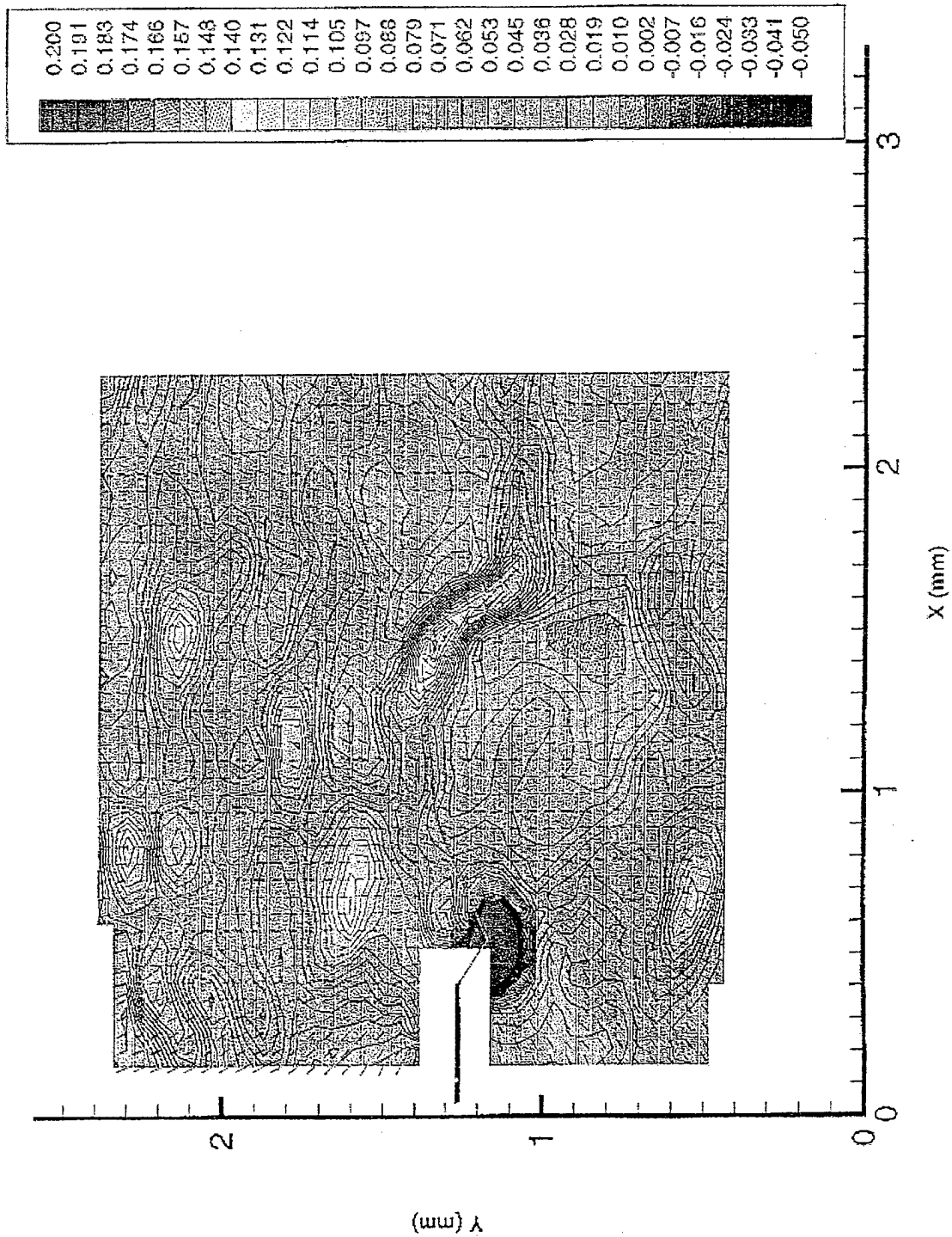
Maximum Principal Strain Distribution of 2.0% Far Field Strain During Loading





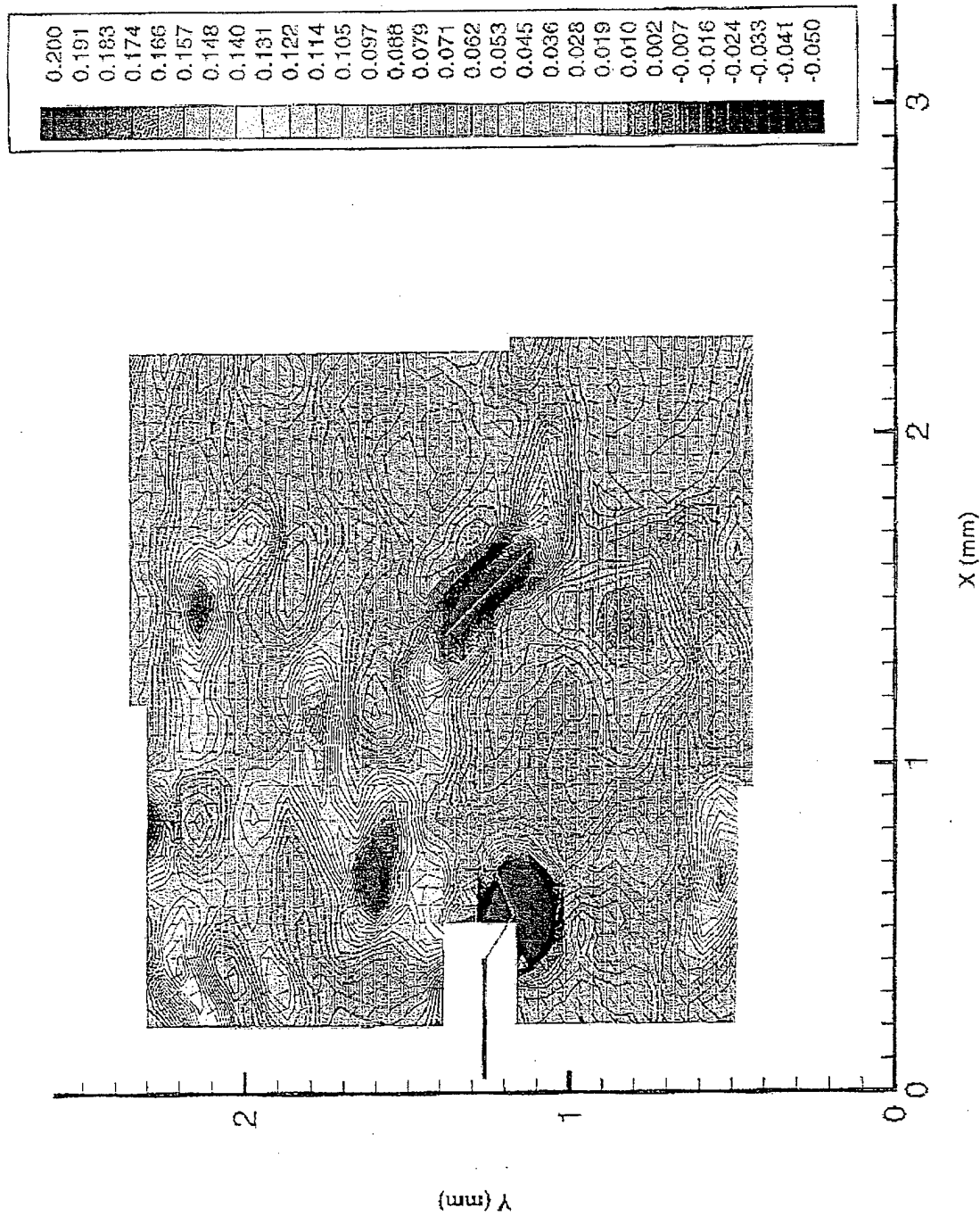
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Maximum Principal Strain Distribution of 6.0% Far Field Strain During Loading





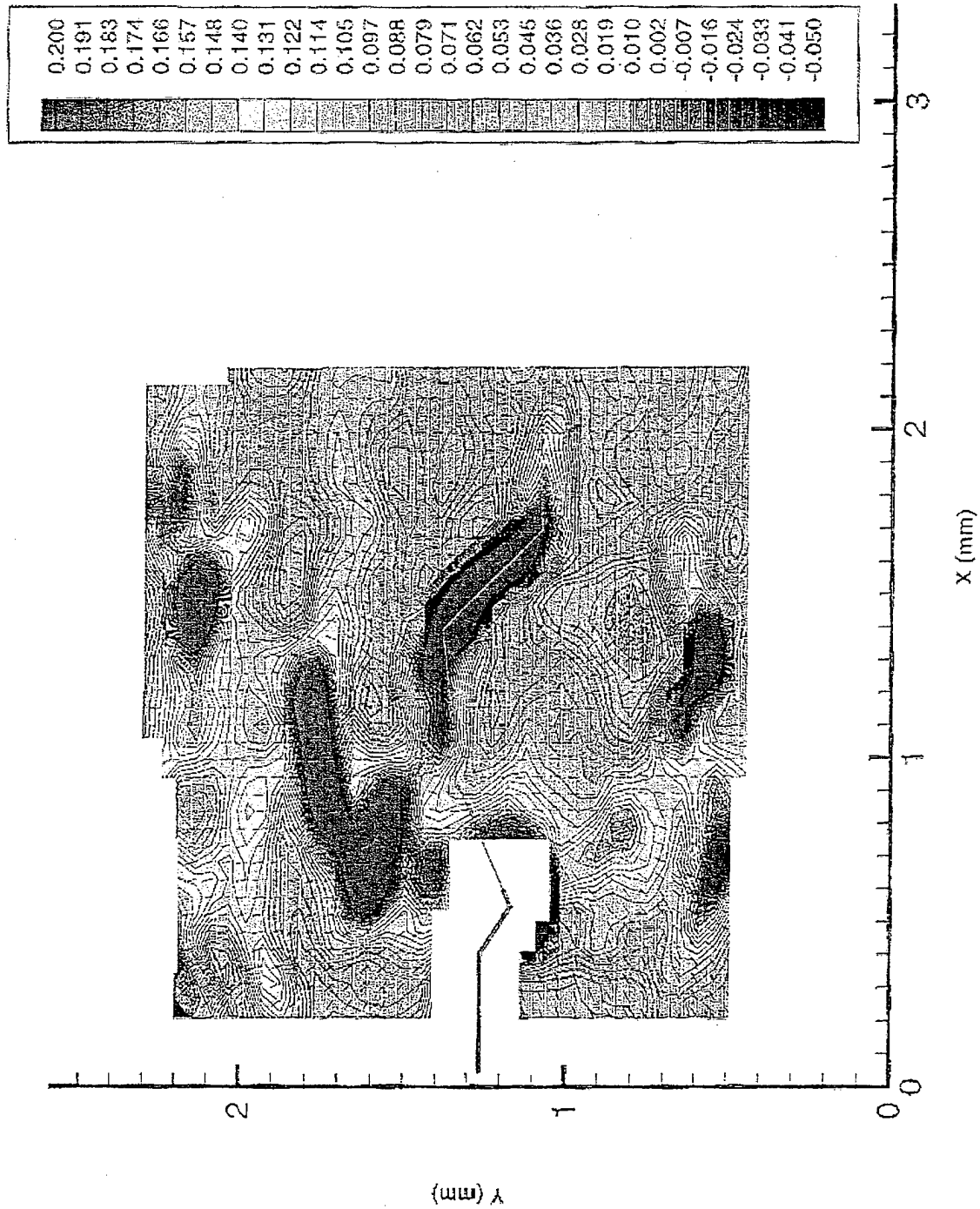
Maximum Principal Strain Distribution of 8.0% Far Field Strain During Loading





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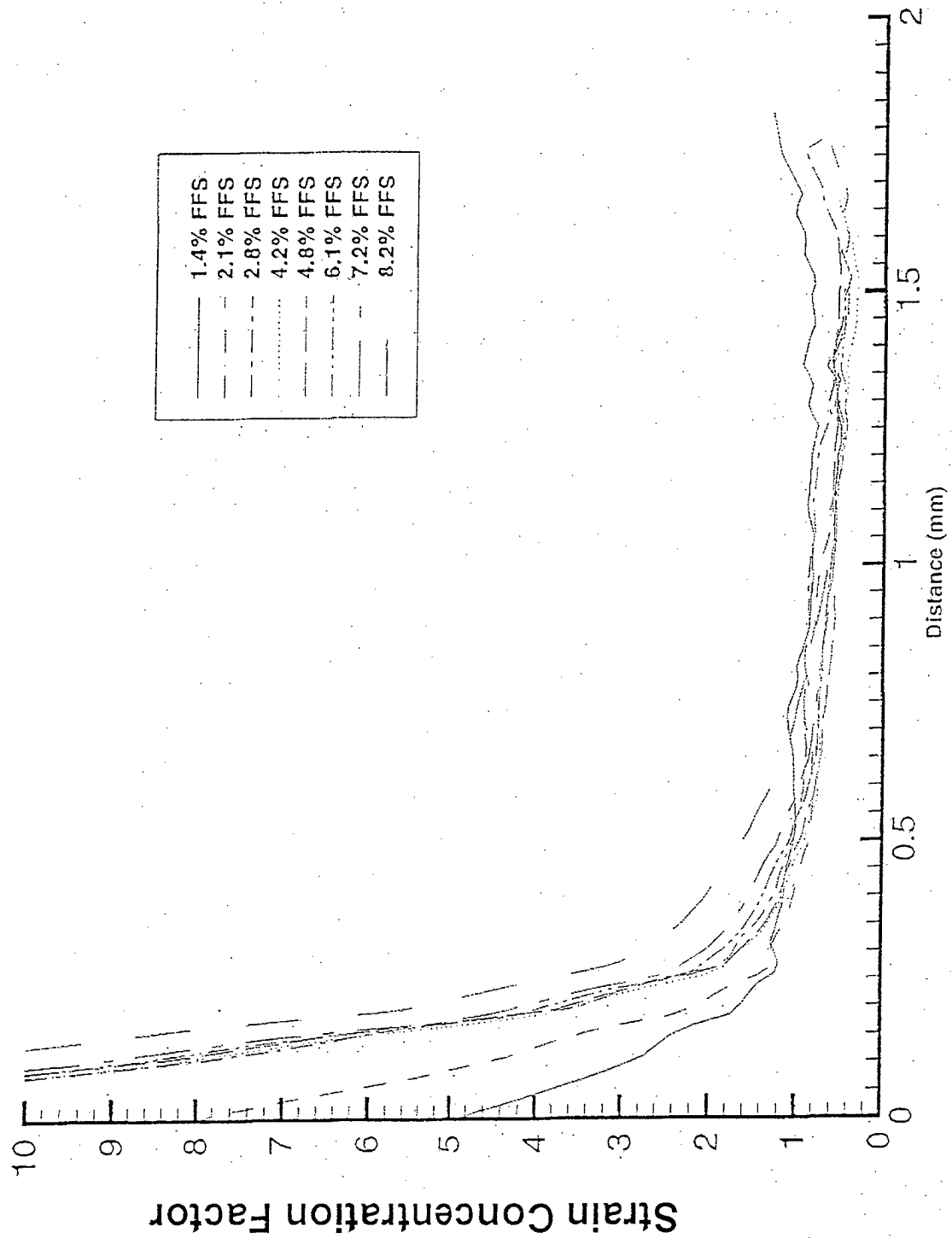
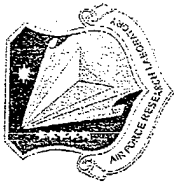
Maximum Principal Strain Distribution of 10.0% Far Field Strain During Loading





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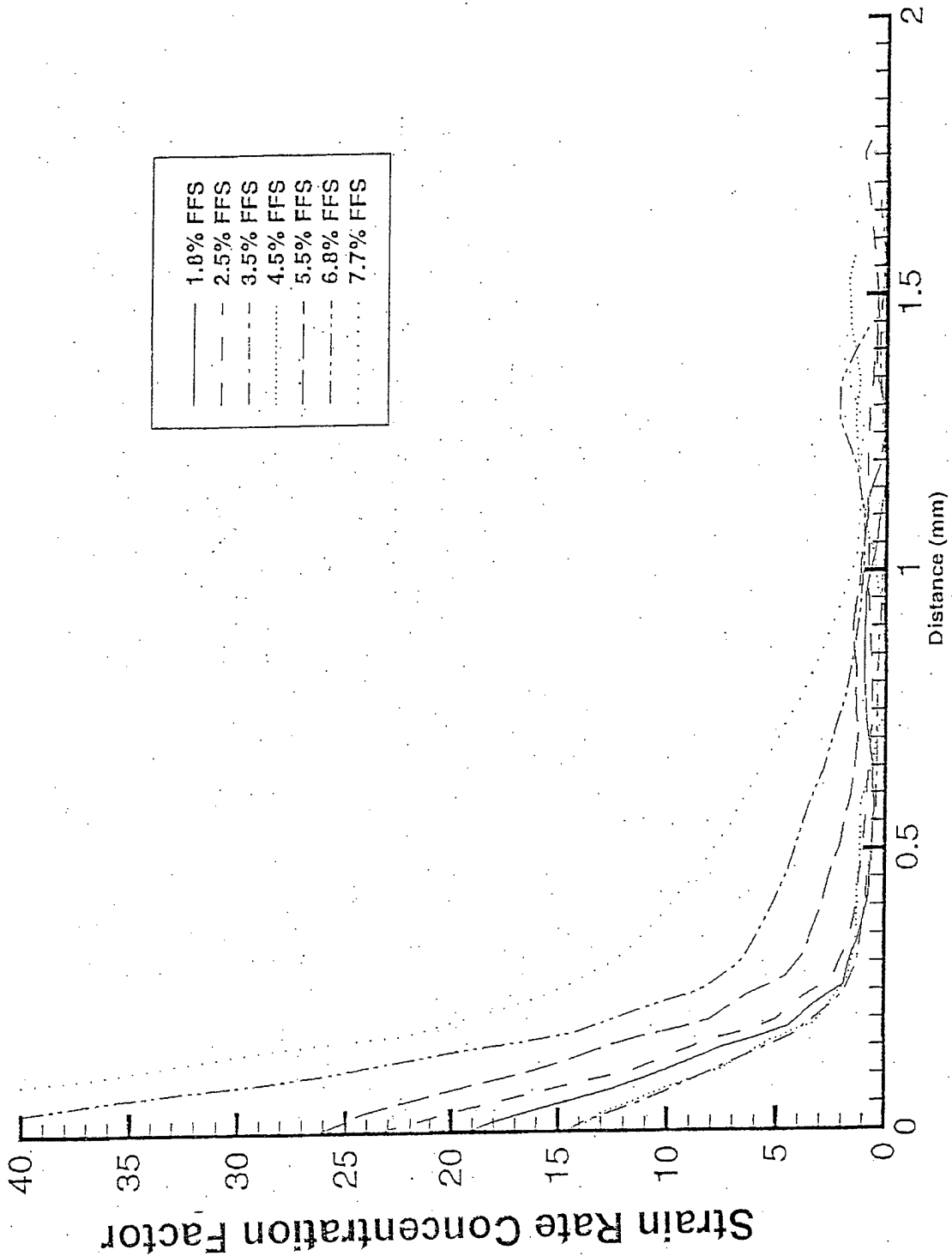
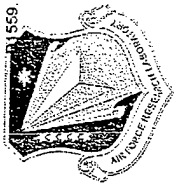
Strain Concentration Factors along the $y=0$ line for Far Field Strains from 1.4% to 8.2%





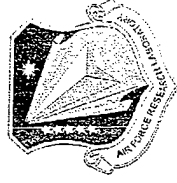
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Strain Rate Concentration Factors along the y=0 line for Far Field Strains from 1.8% to 7.7%





Conclusions



- ¥ The strain distributions near a filler particle depend on time and the magnitude of the applied stress.
- ¥ Both tensile and compressive strains exist in the material.
- ¥ The microstructure of the material has a significant effect on the strain fields near the crack tip.
- ¥ The crack growth mechanism consists of void generation and coalescence with the main crack tip.